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AUTHOR Belanger, Charles H.; Lavallee, Lise
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ABSTRACT

The private internal rate of return to investment is evaluated in two levels in each of the following four educational programs: computer science, nursing, nutrition, and social work. In these fields, a situation occurs in which many bachelor's degree graduates and community college vocational degree holders perform exactly the same work and receive different salaries. The monetary benefit returns to individuals are calculated by using the cost-benefit analysis method. The method is based on the assumption that the income that an average individual with a sepcific level of education in a given field will be earning years later can be estimated based on the average income currently being earned by people having the same characteristics. Returns to investment in a bachelor's degree versus a community college vocational degree range from 5.4 percent for nurses to 18 to 20 percent for computer science and social work graduates. It is suggested that these results will be useful not only to public employment agencies and educational institutions, but particularly to individual students who strive to acquire the most profitable level of education in the most economical way. (SW)

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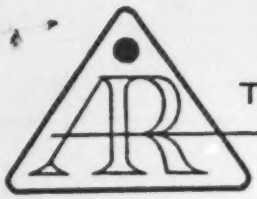

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Mary Corcoran
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# ECONOMIC RETURNS TO SCHOOLING DECISIONS

Charles H. Bélanger*
Senior Research Officer
Office of Institutional Research
Université de Montréal
Case postale 6128, Succursale A
Montréal, Québec
Tel. 514-343-6155

and

Lise Lavallée*
Research Economist
Office of Institutional Research
Université de Montréal
Case postale 6128, Succursale A
Montréal, Québec
Tel. 514-343-6155

* The views expressed do not necessarily reflect those of the Office of Institutional Research

## ABSTRACT

This paper is an attempt to determine the private internal rate of return to investment in two levels and four selected educational programs (computer science, nursing, nutrition, and social work). In these fields, a perennial uneasy situation occurs in which many bachelor's degree graduates and community college vocational degree holders perform exactly the same work and receive different salaries. The monetary benefit returns to individuals are calculated by using the cost-benefit analysis method. Results will be useful not only to public employment agencies and educational institutions but particularly to students who strive to acquire the most profitable level of education through the most economical way.

# ECONOMIC RETURNS TO SCHOOLING DECISIONS

The basic policy choice question studied in this paper is the following: is it economically profitable for community college vocational degree holders in selected fields to invest further in a bachelor's degree when they can have access to jobs in which degree holders of both levels of education are eligible? Workers with less formal education feel they deserve equal pay for equal work while those with more schooling are hardly satisfied with the salary differentials existing between the two levels of schooling. This situation is often creating animosity among workers themselves and confusion with employers. At the end, educational institutions are being criticized for producing outcomes that serve neither the cause of efficiency nor equity.

## Education as an Investment

Benefit returns to education are generally classified into four broad categories: private monetary, private nonmonetary, social monetary, and social nonmonetary (Gaunden, 1967). This paper focuses on the private monetary returns. By leaving the other kinds of benefits aside, the authors do not mean to imply that the consumption benefits to education do not accrue to individuals and society but only to indicate that the great complexity and difficulty to measure and quantify many of these elements go beyond the scope of this study.

Pioneering economists of education such as Houthakker (1954), Hansen (1963), and Becker (1964a, 1964b), have long recognized that expenditures on education

were an investment not fundamentally different from other investments. In line with the human capital theory, education is considered as an item currently purchased that will produce benefits in the future (Taubman and Wales, 1974); for that reason, individuals undertake educational investments in themselves hoping to gain some benefits from them during their remaining working lifetime. For an individual, the costs of investing in education include direct expenses for registration, tuition, fees, supplies, extra-curricular activities, and earnings foregone while attending school; returns to that investment in schooling consist of actual differences in income that can be attributed specifically to formal education and training throughout a lifetime. Educational attainment is not the only determinant of earnings (Gintis, 1971; Taubman and Wales, 1974; Ribich and Murphy, 1975); however, when the salary structure of the average worker in a specialized field becomes regulated by collective bargaining agreements either in the private or public sector, the influence of factors such as motivation, mental ability and physical health on income is expected to be much more limited.

Rate-of-Return Approach

While most studies (Jencks, 1972; Psacharopoulos, 1972) have consistently indicated a positive relationship between the level of schooling in workers and their earnings, the fundamental question remains whether the discounted income gain is smaller or greater than the amount of the extra spending required to induce it. Economists have customarily answered this question by computing the internal rate of return (r) or the present discounted value of the additional income stream arising from education. Nollen (1975) surveyed several studies dealing with the private rate of return to college education

marginal to high school education and reported percentages ranging from 12% to 16% in favor of college graduates. Comparisons between the rates of return to college graduates with those to one- and two-year college dropouts seemed to be inconclusive. Hansen (1963), Becker (1964a), and Hanoch (1967) obtained a much higher r for college graduates. However, Taubman and Wales (1973, 1974) arrived at the opposite findings; Raymond and Sesnowitz (1975) pointed toward the same conclusion and suggested that the high r earned by the one- and two-year college dropouts might be a recent phenomenon.

Bachelor's vs Community College Degree

In the Province of Quebec, the educational system is such that students can either attend a community college for two years and then enroll in a university program for another three years to get a bachelor's degree; or they can register in a three-year program at the community college level and obtain a so-called vocational or technical degree. By and large, this decade-old system has produced reasonable outputs; there is however a certain degree of confusion and questioning in some fields over the economic viability of acquiring a bachelor's degree when certification requirements and occupational qualifications make it equally possible for degree holders of both levels of institutions to be considered for the same jobs.

In an attempt to answer the basic question, the four following fields of study were used as prototypes: computer science, nursing, nutrition, and social work. With the notable exception of computer science, the majority of the graduates from both educational levels in these chosen fields are more heavily employed in the public and parapublic sector. Out of the four selected fields,

nursing is the only one where graduates must be certified by law to be granted the right to practice; the successful passing of an examination after either a vocational degree or a bachelor's degree insures that right.

## Methodology

The method used in this study is based on the assumption that one can estimate what an <u>average</u> individual with a specific level of education in a given field will be earning n years later, as measured by the <u>average</u> income currently being earned by people having the same characteristics, but in a cohort n years later. The private rates of return related to the levels of schooling and the types of education were calculated in the conventional manner by solving the following discount formula:

$$NPV = \sum_{t=m}^{n} \frac{B_t}{(1+r)^t} - \sum_{t=1}^{m} \frac{C_t}{(1+r)^t}$$

where

| | | |
|---|---|---|
| NPV | = | Net present value |
| $t \ (1,m)$ | = | Number of years at school |
| $t \ (m,n)$ | = | Number of years at work |
| $B_t$ | = | Additional before-tax income associated with a specific level and type of schooling |
| $C_t$ | = | Additional cost outlay associated with the acquisition of a specific level and type of schooling |
| r | = | Private internal rate of return |

The cost variable ($C_t$) incorporated in the mathematical model was calculated from estimates of the following sub-elements:

$$C_t = (O_t + T_t + A_t) - (S_t + P_t)$$

where $O_t$ = Opportunity cost (foregone income)

$T_t$ = Tuition

$A_t$ = Academic supplies

$S_t$ = Scholarships and/or Assistantships

$P_t$ = Part-time earnings

Three important steps were involved in estimating the private internal rates of return:

(1) the construction of yearly and lifetime income streams by field for bachelor's degree and community college vocational degree graduates, and also for community college vocational degree holders who would work during three years and then would start taking a bachelor's degree on a part-time basis over a five-year period; for additional information and comparisons, education-income profiles were obtained for high school graduates as well;

(2) the calculation of yearly and lifetime income differentials (additional gross income due to a higher level of education) by field for each of the education level combination mentioned in the first step; and

(3) the netting out of the additional costs associated with the acquisition of a higher level of schooling; as foregone income is the dominant

cost consideration, it was vital to make the exact connection with the salary profile of the working individual at the next lower level of schooling.

All basic data were related to income rather than earnings; also, the dollar value was kept constant. As income differentials have no discernible impact after an extrapolation over a period of 20 years or more, income streams were arbitrarily frozen after 20 years up to age 65. Contrary to most studies of this type, estimating lifetime income streams was not as laborious as it could have been since in most cases collective bargaining agreements had these estimates conveniently all mapped out for the next 20 years at various educational levels.

Results

Table 1 presents three related kinds of information:

(1) the additional lifetime income represents extra income arising from extra education; these figures do not take additional schooling costs into consideration;

(2) the additional net present value (NPV) at a 0% and 10% discount rate exhibits dollar sign estimates when extra schooling costs are accounted for; when compared with the additional lifetime income column figures, the 0% column data give an estimate of the cost involved in acquiring a higher level of education, while the 10% column results not only reflect individual time preference rate but also indicate how one's educational investment offsets or fails to check inflation in the current years; and

TABLE 1

PRIVATE ECONOMIC RETURNS TO INVESTMENT IN SELECTED FIELDS

| Case | Selected Fields | Additional Lifetime Income $ Can. | Additional Net Present Value (NPV) $ Can. | | Internal Rate of Return (r) |
|---|---|---|---|---|---|
| | | | 0% | 10% | NPV = 0 |
| | COMPUTER SCIENCE | | | | |
| 1 | B.D. vs. C.C.V.D. | 279 544 | 260 551 | 16 701 | 18.3% |
| 2 | B.D. vs. C.C.V.D. + P.T.B.D. | 46 249 | 29 141 | - 3 019 | 6.5% |
| 3 | B.D. vs. H.S.D. | 498 826 | 468 349 | 32 246 | 18.0% |
| 4 | C.C.V.D. vs. H.S.D. | 233 886 | 218 417 | 15 976 | 17.8% |
| | NURSING | | | | |
| 1 | B.D. vs. C.C.V.D. | 55 071 | 35 605 | - 5 730 | 5.4% |
| 2 | B.D. vs. C.C.V.D. + P.T.B.D. | -105 168 | -122 189 | - 19 627 | * |
| 3 | B.D. vs. H.S.D. | 190 553 | 159 800 | 1 035 | 10.4% |
| 4 | C.C.V.D. vs. H.S.D. | 141 517 | 126 135 | 6 839 | 14.2% |
| | NUTRITION | | | | |
| 1 | B.D. vs. C.C.V.D. | 191 073 | 172 116 | 5 510 | 12.7% |
| 2 | B.D. vs. C.C.V.D. + P.T.B.D. | - 26 782 | - 43 294 | - 12 359 | * |
| 3 | B.D. vs. H.S.D. | 439 498 | 411 933 | 28 125 | 17.9% |
| 4 | C.C.V.D. vs. H.S.D. | 262 014 | 247 382 | 22 922 | 22.5% |
| | SOCIAL WORK | | | | |
| 1 | B.D. vs. C.C.V.D. | 275 817 | 259 263 | 17 064 | 19.4% |
| 2 | B.D. vs. C.C.V.D. + P.T.B.D. | 45 614 | 30 945 | - 1 176 | 8.2% |
| 3 | B.D. vs. H.S.D. | 400 909 | 371 675 | 20 422 | 15.6% |
| 4 | C.C.V.D. vs. H.S.D. | 124 952 | 110 089 | 3 267 | 11.9% |

B.D. = Bachelor's Degree
C.C.V.D. = Community College Vocational Degree
P.T.B.D. = Part-time Bachelor's Degree
H.S.D. = High School Diploma

* The discount formula cannot be solved for a unique r when there is more than one change of signs in the lifetime earnings stream.

(3) the internal rates of return to four educational attainment alternatives in each of the four selected fields (NPV = 0).

Returns to investment in a bachelor's degree (B.D.) vs. a community college vocational degree (C.C.V.D.) range from 5.4% to 19.4%, all fields being considered. With their discount rates in the neighborhood of 18-20%, computer science and social work graduates are evidently the main beneficiaries of investing in an undergraduate degree. While nutritionists (12.7%) are reaping pecuniary benefits reasonably above inflation level, nurses are getting returns of only 5.4%. An investment in a computer science bachelor's degree, as an example, will pocket its average holder an additional $260 551,00 dollars over a lifetime period; by contrast, the same education investment in nursing will produce only $35 605,00 dollars more. As explained previously, one can see that the amounts appearing in the NPV (0%) column are consistently lower than the corresponding values shown in the additional lifetime income column.

Case 2 of Table 1 displays equally interesting features. Note again that this examplifies the situation of a B.D. graduate vs. a C.C.V.D. holder who, after three years' experience, decides to undertake a bachelor's degree on a part-time basis over a period of five years. Theoretically, one would expect the B.D. graduates in all fields to lose much of their edge on their counterparts; in some way, the rates of return and the NPV (0%) obtained for computer science and social work reflect that expectation. However, nursing and nutrition results clearly indicate that straight B.D. graduates are big losers to individuals who get a C.C.V.D. first and then a deferred bachelor's degree on a part-time basis. Accordingly, B.D. nurses and nutritionists would be respectively short changed by $122 189,00 and $43 294,00 dollars. To provide interested readers with additional information, economic returns to B.D. and C.C.V.D. education marginal to high school (H.S.) education are also presented in Table 1.

Focusing on Economic Strategies

This section examines the situation of a financially minded student or young worker who, before engaging in a particular educational investment, tries to streamline the most profitable course of action. Typically, the first preoccupation that comes to one's mind is whether a specific path will yield more private benefit returns. This question was globally answered in Table 1 from a whole lifetime point of view. Without necessarily assuming that individuals have rather short views of their financial returns, most show greater interest in knowing how much more money per year their additional spending on education will mean to them. Figure 1 exhibits yearly earnings differentials for various alternatives in each selected field. An investment in a computer science and social work B.D. education vs. a C.C.V.D. education sounds like a financially sound decision; in 1990, as an example, B.D. graduates would have a yearly before-tax salary edge close to $5 000,00 dollars. The same applies to nutrition but to a lesser degree. On the contrary, a nursing B.D. education is not a very attractive proposition since yearly salary differentials are almost negligible.

Results indicate that computer science and social work C.C.V.D. holders who would take a P.T.B.D. would almost catch up with B.D. salaries. It seems only logical to think that additional schooling costs and some delay to integrate the B.D. salary scale structure will always cost the C.C.V.D. + P.T.B.D. graduates some negative yearly salary differentials. However, this does not hold to be true in the nutrition and nursing fields, as they surpass B.D. salaries. This can be explained by the fact that C.C.V.D. salaries are already competitive with B.D. salaries, and when C.C.V.D. graduates get their P.T.B.D., accumulated years' experience places them in an advantageous

Legend

| | |
|---|---|
| B.D. vs. C.C.V.D. | ——— |
| B.D. vs. C.C.V.D. + P.T.B.D. | - - - - - - |
| B.D. vs. H.S.D. | -·-·-·- |
| C.C.V.D. vs. H.S.D. | ..... |

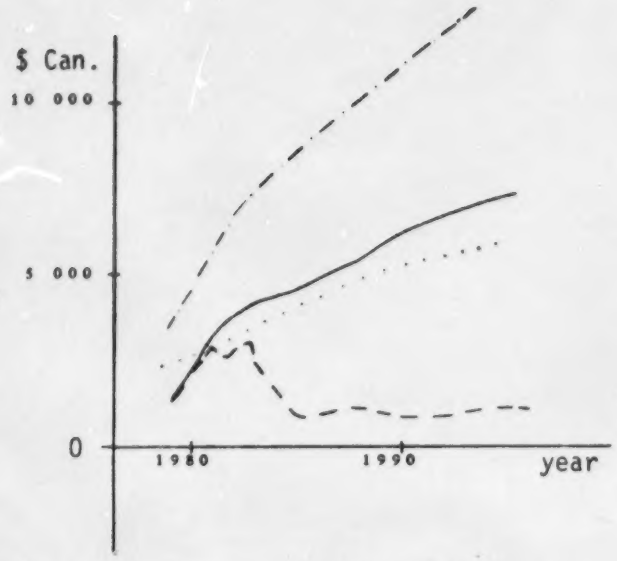


Figure 1a
COMPUTER SCIENCE
Yearly Earnings Differentials

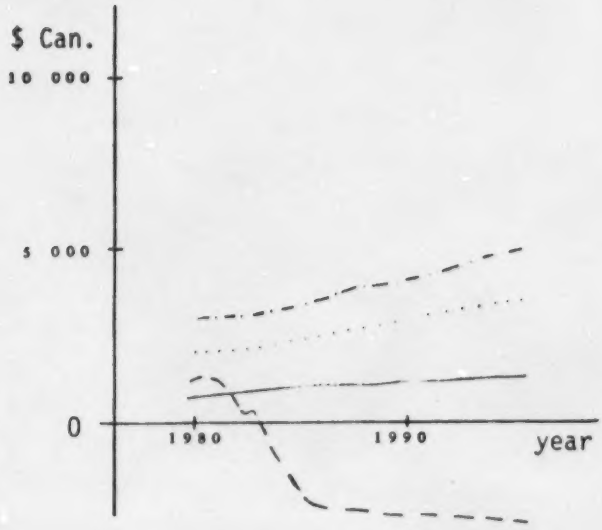


Figure 1b
NURSING
Yearly Earnings Differentials

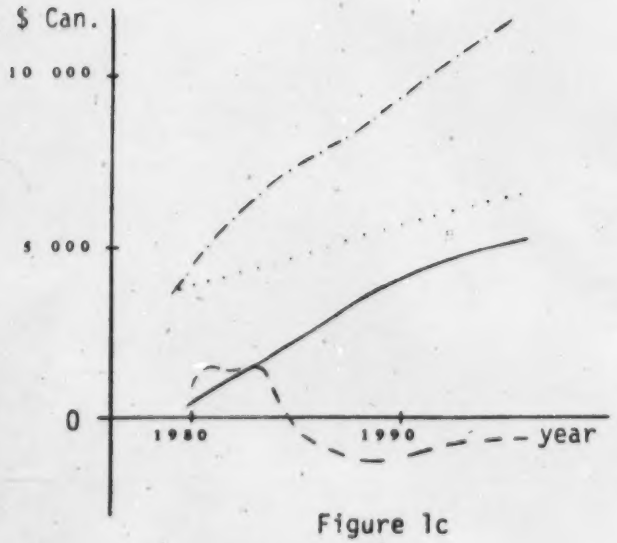


Figure 1c
NUTRITION
Yearly Earnings Differentials

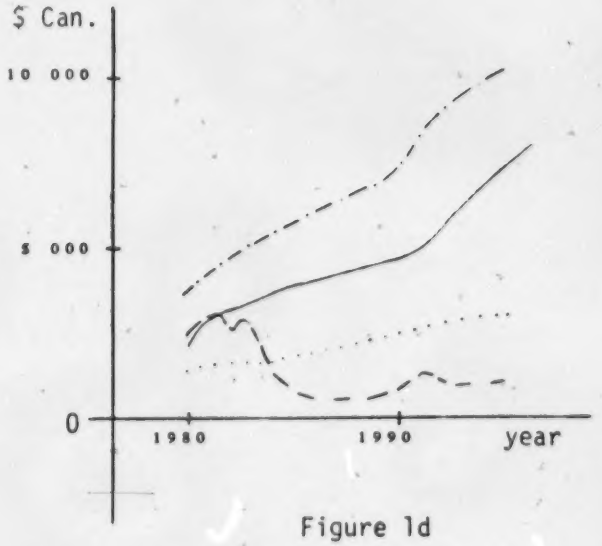


Figure 1d
SOCIAL WORK
Yearly Earnings Differentials

position in the salary scale structure. For illustrative purposes, B.D. and C.C.V.D. vs. H.S. yearly earnings differentials are plotted out as well in Figure 1.

Individuals might want to assess their educational investment in comparison with any other monetary investment. Assuming that capital invested today at a 10% interest rate is generally recognized to beat slightly the present inflationary rate level, finding out whether investment in extra education will prove to be a reasonable deterrent to inflation represents some policy interest. Figure 2a shows that, once the early years accounting for schooling costs and specially opportunity costs are over, a social work and computer science B.D. education vs. C.C.V.D. education offers adequate protection against inflation. In the case of nutrition it is more open to question since higher-than-inflation gains are mildly recorded only past 1995. Investment in a nursing B.D. would earn well below inflation level, both on a yearly and lifetime basis. Also of policy interest is Figure 2b; none of the B.D. graduates would cash in benefit returns large enough to compensate for inflation.

## Implications and Conclusions

Private rates of return obtained in this study are, for the most part, unequivocal. High returns to a B.D. education in computer science and social work should be strong encouragement for high school students to follow the bachelor's degree route right away. C.C.V.D. holders in these same two fields would improve their lot considerably by investing in the next higher level of education; their investment would come close to compete with ongoing inflationary rate level.

The near equality between the rates of return for the B.D. and C.C.V.D. nurses is strikingly conclusive. The only questionable field would be nutrition where the B.D. vs. C.C.V.D. education returns draw some attention but may not be sufficiently large to make an investment really profitable; this assertion does not seem unreasonable when one considers that approximately 30% of professionals' earnings is recovered by the government in the form of additional tax revenue.

Before closing, the authors want to stress the fact that the purpose of this study was limited to the study of pecuniary benefits accruing to the average individual, as measured by the before-tax monetary income of individuals. All other benefits, either social (quality of life, quality of schools, etc.) or private (job satisfaction, security, etc.) were not included; these benefits can have a positive or negative effect on private monetary returns. Even though studies have proved that people with less education but equal ability and entrepreneurial talent can deliver as much and as well as individuals with more formal education, there is a tendency, specially in the public sector, to use education as a screening device. In instances where an additional level of education does not result in greater productivity, it becomes obvious that excessive social costs are passed on down to taxpayers. Irrespective of this pattern, it would be tempting to conclude that present rates of return to higher education are likely to be below their long-term equilibrium values because of a slow economic situation (3.4% GNP growth), inflation (7.8% CPI increase), and high unemployment (8.8%); however, there appears to be a strong desire in the public sector to slow down salary demands so as to bring them back in line with wage increases paid in the private sector.

Legend

| | |
|---|---|
| B.D. vs. C.C.V.D. | ——— |
| B.D. vs. C.C.V.D. + P.T.B.D. | - - - - |

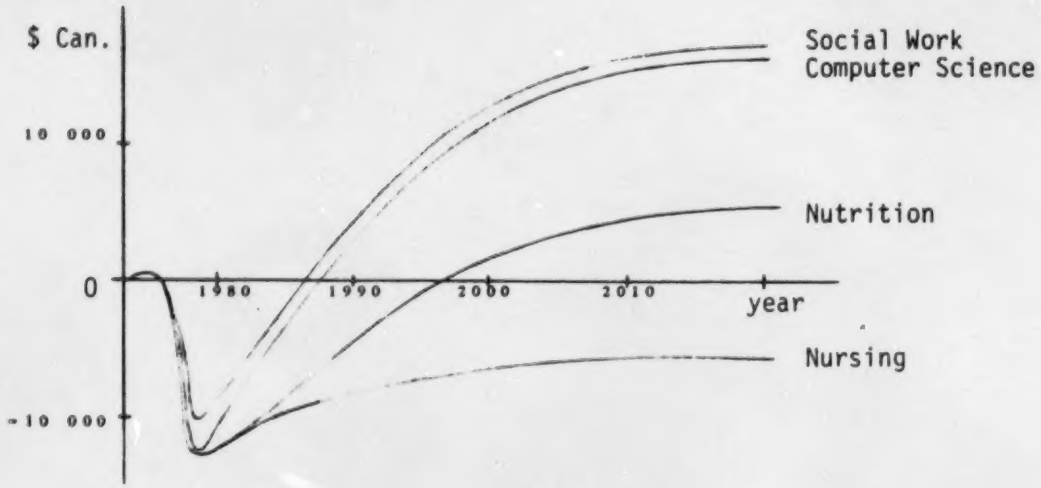


Figure 2a

ADDITIONAL YEARLY AND LIFETIME NET PRESENT VALUE
DISCOUNTED AT 10%

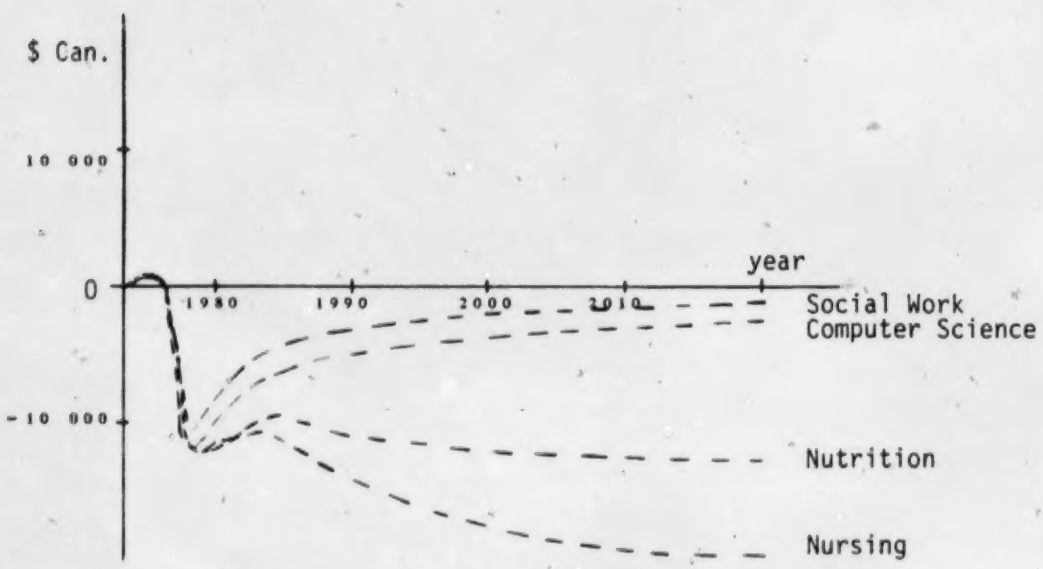


Figure 2b

ADDITIONAL YEARLY AND LIFETIME NET PRESENT VALUE
DISCOUNTED AT 10%

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